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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/856,966	09/06/2001	Peter A. Dowben	UNVN.62457/0	5124

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09/20/2002

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EXAMINER

PALABRICA, RICARDO J

ART UNIT

PAPER NUMBER

3641

DATE MAILED: 09/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/856,966

Applicant(s)

DOWBEN ET AL.

Examiner

Rick Palabrica

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>5,6,10,11</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's amendment in Paper No. 8, dated 8/05/02, amending the specification and Fig. 6, and traversing the rejection of claims 1-13, is acknowledged.

The drawing amendment is acceptable.

2. Applicant traversed the claim rejections based on Seidel et al. on the grounds that the boron carbide neutron converted layer is not an electrically active part of the device, contrary to the disclosure in claim 1. Applicant also alleges that the Seidel et al. detector does not allow for the overall thickness of the device to be reduced while retaining high efficiency of neutron detection.

Applicant's arguments have been fully considered but they are not persuasive for the following reasons:

a. Applicant has not defined the term "electrically active part" in the disclosure. The neutron converter layer of Seidel et al. reads on this limitation of being "electrically active" because this term is interpreted as "having an active part in the production of electrical pulses from the detector." Note that this converter layer generates the charged particles (from neutron interactions) that create the pulses from the detector.

b. The neutron converter layer of Seidel et al. has the same structure as the claimed boron carbide layer in the claims, and it must also inherently function in the same manner to produce the same results as applicant's situation. As to limitations

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which are considered to be inherent in a reference, note the case law of In re Ludtke, 169 USPQ 563, In re Swinehart, 169 USPQ 226, In re Fitzgerald, 205 USPQ 594, In re Best et al., 195 USPQ 430, and In re Brown, 173 USPQ 685, 688.

c. As to the reduction in detector size claimed by applicant, limitations relating to size is not sufficient to patentably distinguish an invention over prior art. See MPEP 2144.04.IV.A.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2, 3 and 13 rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. These claims pertain to a homojunction diode. In paper No. 8, applicant cited Seong-Don Hwang et al. as evidence of prior art on homojunction diodes. This reference states that nickel doping of an undoped semiconductor material produces a homojunction diode. Claim 1 (from which claims 2 and 3 depend) does not, by itself, give a homojunction diode because said claim only recites a "layer of boron carbide semiconductor." Based on the above reference provided by the applicant, the "doping" that is critical to creating a homojunction diode is

not included in the claim(s) and is not enabled by the disclosure. The same applies to claim 13. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976).

Note also that claim 5, which is also dependent from claim 1, recites a "heterojunction diode." This is further evidence of the said lack of critical element because it is not possible for the same structure, as disclosed in claim 1, to be both a "homojunction diode" (e.g., in claim 3) and a "heterojunction diode" (e.g., in claim 5).

4. Claims 2, 3 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The reason is as stated in section 3 above.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4-7, 9, 11 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent 5,940,460 to Seidel et al. (see Figs. 2 and 3, and corresponding parts of the specification). Seidel discloses an array of semiconductor neuron detectors capable of measuring a wide range of neuron fluxes ranging over several orders of magnitude (see column 1, last 2 paragraphs).

Seidel discloses In Fig. 2 a neutron detector (10) that includes a substrate (12) made of a semiconductor material such as silicon. The neutron detector includes a neutron converter layer (22) which generates charged particles when the layer is impinged by neutrons, and suitable materials for said layer include boron carbide (B_4C) – see column 5, lines 1-15. Said neutron converter layer has a preferred thickness of 0.1-22 microns which anticipates the thickness limitation in claim 6 of 1000nm (1 micron)- see column 5, line 31. This layer may be deposited directly on the semiconductor active region (C) -see column 5, lines 18-20. The thickness of semiconductor layer C ranges from about 0.1-5 microns, which anticipates the thickness limitation in claim 7 of less than 600 nm (0.6 microns).

The neutron converter layer reads on applicant's language. "sensing mechanism having a layer of born carbide semiconductor." See also section 2 above.

As to the limitation in claim 11 of the device being able to operate at 500°C, Seidel's neutron detector will inherently be capable of operating at said temperature because it is made of the same materials as that claimed by the applicant. Also, Seidel discloses that his use of high temperature resistant materials such as silicon carbide in the active region of the detector permits extended use in high temperature environments such as nuclear reactors.

As to applicant's claim 12 regarding the method of detecting neutrons, Seidel discloses the same inventive concept of detecting said neuron fluxes including the steps of placing said detector array having multiple semiconductor neutron detectors in a neutron flux field, and receiving electronic pulses from the neutron detector array which

are indicative of the level of neutron flux (see column 2, 1st paragraph and claims 12-23).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8 and 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Seidel. Seidel discloses the applicant's claims except for the use of at least 80% boron-10 and a configuration of at least two diodes interleaved with a neutron absorber.

As to the use of boron-10 enriched to 80%, this is a well-known expedient in the nuclear art to enhance the neutron detection efficiency of boron by increasing the boron-10 isotope above the natural enrichment of 20%. As to the use of two diodes interleaved with a neutron absorber, this is also a conventional application in the nuclear spectrometry art wherein two semiconductor detectors are used in combination with a coincidence circuit, the latter for purposes of eliminating background.

As to the above limitations, which the examiner stated on page 5 of his 3/27/02 Office Action as well known in the art, said statement was not seasonably traversed by the applicant. Therefore, these objects of the well-known statement are taken to be admitted prior art. See MPEP 2144.03.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the neutron semiconductor detector, as disclosed by Seidel, to use 80% boron-10 enrichment for the neutron converter layer and two diodes interleaved with a neutron energy absorber, as this is no more than the application well-known techniques in radiation detection within the nuclear art.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7687 for regular communications and 703-305-7687 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

RJP
September 18, 2002



MICHAEL J. CARONE
SUPERVISORY PATENT EXAMINER